Design, Installation, and Testing of a Cleaner Combustion Technology at a Petroleos Mexicanos (PEMEX) Refinery

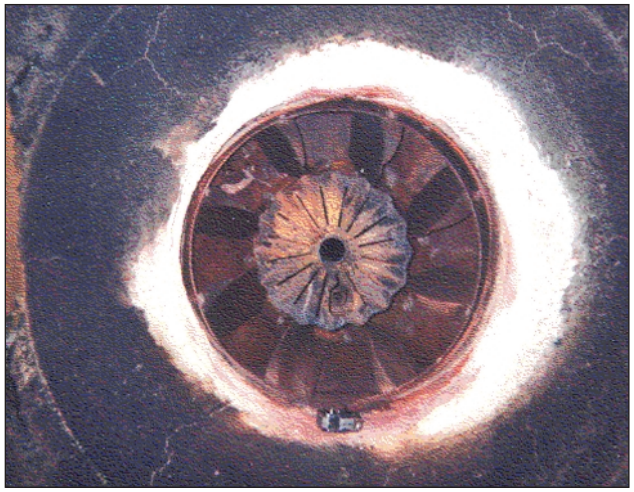
Location: Tampico, on the Gulf of Mexico
Type: Boiler retrofit
Size: 385 MW
Funding: Total: US$760,000
Private: US$145,000
Public: US$615,000
Objective: To increase energy efficiency and reduce greenhouse gas (GHG) and other emissions.
Duration: 1998–2003
Scale: Urban

Summary

This public-private partnership project used innovative combustion technology to retrofit a steam and electric power-generating boiler at the Francisco I. Madero refinery, a large PEMEX facility near Tampico, Mexico. The project is expected to result in annual emissions reductions of 5,300 tons of carbon dioxide (CO_2) and 162 tons of nitrogen oxides (NO_x) at the facility, while simultaneously improving efficiency and reducing operating costs. Seventy percent of total project costs were leveraged from the private sector and Mexican government agencies.

In-Country Principles That Attracted Nondonor Financing

- Institution building and access to justice and enforcement of laws



The key principle that helped attract private-sector financing was a comprehensive energy law that meets global norms and standards and that created a framework for private investment and ultimate privatization.

Financing

Total project investment was US$760,000. Electric Power Technologies (EPT) of California provided US$145,000 in private-sector funding, PEMEX contributed US$390,000, and the United States Agency for International Development (USAID) contributed US$225,000.

The Project

The Madero refinery processes approximately 170,000 bbl/d of crude oil, or about 12% of Mexico's total refining capacity of 1.5 million bbl/d. The refinery has seven boilers, fired primarily by heavy fuel oil. Combined, these boilers generate about 1,400 tons per hour of steam, which is equivalent to 385 MW.

Prior to implementation, the refinery emitted about 1,800,000 tons of CO_2 and 4,000 tons of particulate matter per year.

Acting on its mandate to mitigate GHG emissions in Mexico, USAID initiated a collaborative partnership that emphasized the importance of private-sector participation. Under the partnership, USAID's Center for Environment, USAID Mexico, PEMEX, the Instituto de Investigaciones Electricas (IIE) (Mexico's research institute for the state-owned electric utility), and EPT are working together to accelerate the transfer of environmental control technologies by demonstrating them in real-world conditions.

The project is addressing environmental constraints that impede development, and it is reducing long-term threats to the global environment — particularly the loss of biodiversity — by mitigating GHG emissions while promoting sustainable economic growth.

Technical Data

The technology used in retrofitting the boilers is Reduced Emissions and Advanced Combustion Hardware (REACH). By replacing the refinery's heavy-oil burners with the new technology, combustion efficiency is improved and carbon

and atmospheric particulate emissions are reduced. The REACH burners also reduce GHGs since less oil is required to generate similar amounts of steam and electricity.

Performance Data

The project will reduce CO_2 emissions by about 5,300 tons per year. When the REACH technology is operational in all 40 PEMEX boilers, approximately 200,000 tons of CO_2 will be avoided every year, and annual savings of US$10,000,000 are expected.

Participants and Roles

PEMEX has hosted the project and contributed financing, EPT provided the technology, USAID brokered the partnership with PEMEX and leveraged financing for GHG emissions reduction, and Nexant was responsible for project implementation.

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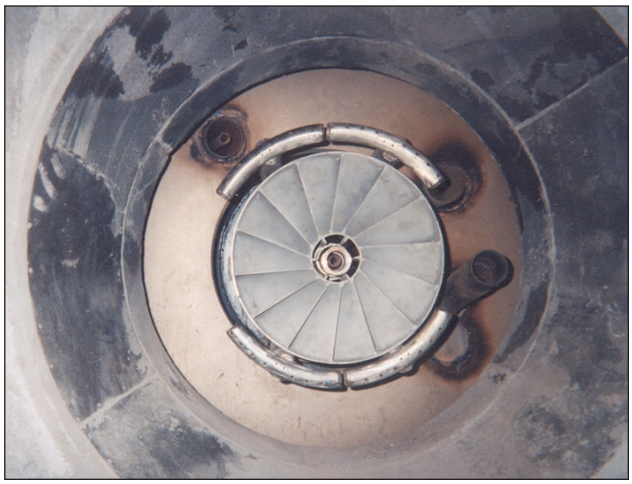

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